faces, and concludes that the fluid by which flies adhere to smooth surfaces is not sticky, that they need no adhesive secretion and that if the fluid were pure water or olive oil it would act the same and that the fly's power of walking on a smooth surface is due simply to capillary attraction. A firm adhesion of the hairs to smooth surfaces, which Hepworth in 1854, and Dahl and Simmermacher consider as necessary, he finds not to exist.——A memoir of great value on the anatomy of a Myriopod (*Lithobius forficatus*), with four colored plates and wood-cuts, but unfortunately wholly in Russian, was published in 1880, by N. Sograff in the Moscow Transactions.——In the Bulletin of the Brooklyn Entomological Society, Nov., 1884, Mr. G. Gabe claims that *Rhyssa lunator* is not a true ichneumon, but a true wood-feeder. The breeding habits are described, and the mode of oviposition. During the process the long ovipositor is bent, passed between the posterior legs, the abdomen is elevated almost to a right angle with the thorax, and the ovipositor, guided by the anterior tarsi is forced with a ramming motion into the wood to the depth of from two or three inches. He has watched many females ovipositing and has cut off the ovipositor when ready to be withdrawn, and in no instance has he found a larva of any kind anywhere near the point reached by the borer, and where the egg was deposited. Messrs. Hulst and Weeks stated that they had reached the same conclusion from independent observation.——During the past winter Prof. Packard has given a series of talks or lectures to the Providence Entomological Society on the structure and habits of insects, in order to aid those members whose time does not permit them to obtain a general knowledge of the subject.——The veteran French Coleopterist, Auguste Chevrolat, died Dec. 16th, in his 86th year.

ZOÖLOGY.

Function of Chlorophyll in Animals.—L. von Graff, dissatisfied with the conclusions of Brandt as to the symbiotic relations of what the latter regards as green algæ to *Hydra viridis*, and with the methods of his experiments, arranged three specimens of *H. viridis* in eight different vessels; four of them, A, B, E and F, he exposed to the light; A, B, C and D were filled with water from an aquarium. In E—G the water was filtered. In A, C, E and G the water was changed daily, in the others it was never changed at all. The first Hydra to die was one in glass G, on the thirty-first day of exposure in which the filtered water was changed daily, and the light shut off. The glass A did not lose a specimen till the 109th day of observation, when one died. In C in which the aquarium water was changed daily, and light shut off, the three specimens died on the 105th, 106th and 109th days; B, in which the water was not changed, and which was ex-

posed to the light, only lost one specimen, and that on the 100th day.

Dr. Graff concludes that the Algæ or pseudochlorophyll bodies of Hydra have no significance as means of nutrition; the fact that all the specimens in filtered water died by the 87th day seems to show that the Hydra died from the want of animal food, and that the green bodies do not serve as such, as Brandt supposes. The most unexpected and perhaps the most remarkable fact is that whether the Hydræ were exposed to the light or placed in the dark, they in all cases retained their green color through life.

Dr. Graff has lately been able to make some observations on the *Mesostoma viridatum*, three out of five examples of which were richly provided with chlorophyll-corpuscles; these varied very considerably in size, and no nucleus was to be detected in the smaller specimens; starch granules of proportionate size to that of the chlorophyll-bodies were found in them. The larger green bodies were arranged in closed groups, and the smaller examples lay between the groups; most of the bodies were rounded, but a few of the larger were oval.—*Journ. Royal Microscopical Society, Dec., 1884.*

A Free-Swimming Sporocyst.—The egg in the digenetic Trematode worms, as is well known, does not at once give rise to the adult Distome, but to a brood-sac which produces directly or indirectly in its interior a greater or less number of larval Distomes. The brood-sacs live parasitically within mollusks, and are known as rediæ or sporocysts, according as they have, or have not, a rudimentary intestine. Neither rediæ nor sporocysts are possessed of much locomotive power, but this appears to be in inverse ratio to the number of the contained brood. The sporocyst of *Cercaria micrura, e. g.*, which contains only a few larvæ is decidedly active. Sporocysts are commoner than rediæ, and exhibit a greater variety of form. Thus Moulinié distinguishes sacciform, cylindrical and tubular sporocysts, a classification which corresponds fairly well to the form of the contained brood. The sacciform sporocysts generally contain the ordinary tailed larvæ or Cercariæ, but the tail may be very short as in *C. micrura* Filippi, or entirely absent as in *C. globipora* Ercolani, again the cylindrical sporocysts produce Cercariæ with furcate tails like *C. furcata*, and the remarkable Bucephalus-larvæ are produced in branched tubular sporocysts.

The object of the present note is to indicate the existence of a hitherto unknown form of sporocyst, one specimen of which I observed recently swimming very actively in an aquarium containing a few water plants and fresh-water mollusks. In form and size it recalls the larger Cercariæ with forked tails, and contains a single tailless Cercaria or larval Distome. In accordance with its free life, the muscular system is much better developed than

usual, and the same is true of the water-vascular system. Of especial interest are tactile papillæ, which beset the surface, and which obviously enable the sporocyst to find the definitive host for its contained larva. These papillæ are somewhat more complicated than the similar structures described by Fischer from the neighborhood of the cirrus-pouch of *Opisthotrema cochleare* (Zeit. wiss. Zool. XL, 12). In a future paper I propose to give a full account of the structure of the sporocyst and its contained larva. It would be premature to attach any specific name to the Distome, as it may turn out to be a well-known form, but I am at present unable to offer any suggestion as to its "whence" or "whither." I examined the mollusks in the aquarium for other specimens in vain, and, in the hope of obtaining others for infection experiments, hardened and sectioned the only one I had secured.

Professor Leuckart, to whom I communicated the substance of the above, writes: "Your observation is certainly calculated to astonish helminthologists. I doubt whether the creature is really free-living, but believe that, in place of the Cercaria, it represents only the swarm-phase of the parasite. An entirely free-living sporocyst, without intestine, would hardly find the conditions necessary for a complete existence. It probably lives parasitically within a mollusk, and wanders out after development of the contained larva, in order to seek a suitable host for the latter. Perhaps it may attach itself to the host by the flat lobes of the forked tail, and then discharge the larva imprisoned within it."—*R. Ramsay Wright, University College, Toronto, Jan. 12, 1885.*

STRUCTURE OF ECHINODERMS.—C. F. Jickeli has a preliminary note in which he states that he has made experiments confirmatory of the doctrine of Carpenter as to the nervous system of Comatula. He finds that a single arm gives no response when the ambulacral groove is touched with a needle or stimulated by an electric current, but that the moment the needle touches the point at which the axial cord lies the arm is strongly flexed, and the pinnulæ more actively. A single cirrus when stimulated appears to be thrown into a tetanic condition. Many of the author's experiments are in exact agreement with those of Carpenter. After the removal of the visceral mass irritation of the capsule produces a synchronous contraction of all the arms. If a few drops of osmic or acetic acid are put in the water, the "torso" moves as actively as an uninjured animal.

The author describes the structure of the cirri, and the processes which pass from the "spongy organ" into them. The observations of P. H. Carpenter that nerve-branches pass into the dorsal and the ventral muscles is confirmed. A series of sections shows that the ambulacral nerve diminishes in extent as it approaches the intestine, and finally disappears. Attention is

drawn to the fact that Götte describes the epithelium of the so-called ambulacral groove of Comatula as being endodermal in origin.

A third nerve-center is described as being present in the connective tissue, and as forming a pentagonal cord around the mouth. The lateral cords are connected by branches with one another at the angles of the pentagon, and they extend along the water-vascular system; each of these cords gives off lateral branches at regular distances, and these innervate the water-vascular system, and the papillæ of the tentacles. Other well-developed branches are also given off to the ventral integument of the body, where they are lost in a fine nervous plexus. Ludwig's view of the glandular character of the tentacles appears to be incorrect. They have 3–4 sensory hairs and a centrally-placed slowly-moving flagellum. From these observations it would follow that the tentacular papillæ are complicated sensory organs.—*Journ. Royal Microscopical Society, Dec., 1884.*

AFFINITIES OF ONCHIDIA.—R. Berg, after discussing the views as to the affinities of the Onchidia, which have been held by preceding writers, protests against the doctrine that they are nudibranchiate mollusks, and claims them as decidedly pulmonate; their nervous system does not differ essentially from that of the Pulmonata; it only differs in having the lowermost part more condensed and reduced, the opthalmophores are like those of the stylommatophorous Pulmonata, and the pedal glands have very similar relations, as has too the digestive system. It is true that the Onchidia are "opisthobranchiate," but so are Arion and Limax; in this group, at any rate, the position of the heart has no systematic significance. The kidney is very like that of the Pulmonata, and the difference between the sizes of the lung-cavity is to be explained as due to the largely cutaneous mode of respiration in the Onchidia. The most striking proofs of relationship are to be found in the structure of the generative system; the seminal duct has a position in the lateral wall of the body, such as has never yet been demonstrated in any Nudibranch, but only in the Pulmonata. The Onchidia are Pulmonata which have adapted themselves to an amphibiotic or marine mode of life.—*Journ. Royal Microscopical Society, Dec.*

ZOOLOGICAL NOTES.—*Polyzoa.*—The Polyzoa of the *Challenger* Expedition have been described by Mr. Geo. Busk, who finds that out of 286 species of Cheilostomatous Polyzoa, no less than 180 are new. The Reteporæ alone have been raised from 31 to 60. In the North Pacific four species were procured from 3125 fathoms. Certain species have a great bathymetrical range. *Cribrilina monoceros*, one of the four taken in 3125 fathoms, was in the South Pacific taken in 1325 fathoms; from 69 fathoms near Kerguelen; from 55 in the South Atlantic, and from 35 in

the Australian region. As a rule, however, the species having the wider geographical distribution are those from the shallower depths. Another exception to this rule is the genus Catenicella, rich in species, and almost confined to shallow Australian seas.

Mollusca.—*Nature*, in reviewing Dr. R. Bergh's report upon the Nudibranchs collected by the *Challenger*, remarks that few shallow water dredgings were made during the cruise, and thus it is not strange that only twenty-five species were found. The majority of them are Phylliroidæ and Æolidiadæ, and are pelagic; some are littoral, as *Janclus australis*, of which a single specimen was taken in the Arafura sea. Another, *Cuthonella abyssicola*, was taken by the trawl in Farœ channel at 608 fathoms. Some new Tritoniadæ and Doridiadæ are described, and among the latter the most interesting is *Bathydoris abyssorum*. The body of this species is semiglobular, as in the genus Kalinga of Alden and Hancock, and it resembles this genus also in having branchiæ composed of several separate branchial tufts, as well as in the presence of soft conical papillæ on the back. It has no frontal appendage, and a very slightly pronounced dorsal margin, and seems to connect the Doridiadæ with the Tritoniadæ. The only specimen was taken in 2425 fathoms in the middle of the Pacific. The body of the living animal was gelatinous and transparent, the foot dark purple, the tentacles brown, and the gills and other external organs orange. One specimen only of the Onchidiadæ, *O. melanopneumon*, was taken in shallow water at Kandara, Fiji. Dr. Bergh believes these animals to have no relation to the Nudibranchs.——Mr. J. R. Davis (*Nature*, Jan. 1), assert that limpets have a settled home, for they occupy scars on the rock, often sunk to a considerable depth. He marked and watched specimens to prove this, and found that, though a marked limpet might move about three feet from its scar in any direction, in search of food, it always found its way back. A limpet always returns before the rising tide reaches it, and roosts with its snout pointing in the same direction. Mr. Davis asks what sense is used? The eyes of a limpet, mere sensitive cups, can at most distinguish different degrees of light intensity; the examples deprived of their tentacles found their way back, and repeated washing of the track with sea-water in order to destroy scent did not prevent the limpets' return.

Stelechopoda.—Dr. L. von Graff has described the Myzostomida of the *Challenger* collection. Myzostomes are small disk-like animals which were attached to crinoids, and their cysts have been found upon the stalks of fossil Pentacrini. Dr. von Graff requests any palæontologist having crinoids under his care to examine the specimens, and, if he should notice little pustules at the base of the pinnules, to communicate with him. Graff's class Stelechopoda embraces the Tardigrades, Linguatulids and Myzostomes. The forms before known were characterized by the

peculiar radial arrangement of the organs of the body, but among the sixty-seven species here described are many which are without this radial arrangement, while in Stelechopus not even the muscular septa and parapodal muscles are convergent. This fact strengthens Dr. von Graff's previous idea that the radial symmetry was an adaptive change due to fixation. Several forms are entirely without suckers, while in *M. calycotyle* the suckers are stalked. The Myzostomes are diœcious, but the sexes unlike. When inhabiting the same cyst the female is usually from fifty to a hundred times larger than the male.[1]

Crustacea.—Dr. P. P. C. Hoek found complemental males in nineteen out of the forty-one new species of Scalpellum gathered by the *Challenger* Expedition. Some of those complementary males do not show a division of the body into capitulum and peduncle; a second section still without such division has rudimentary valves; a third has valves, capitulum and peduncle. Darwin's "true ovaria" are believed to be pancreatic glands.

Birds.—Dr. W. Buller (Trans. N. Z. Institute, 1883) furnishes notes on some rare New Zealand birds. *Sceloglaux albifacies*, the laughing owl, has been found in deep fissures of the limestone rocks at Albury, near Timaru. Examples were procured by a process of smoking-out. In this species the male is the larger bird, and has a harsher cry than its mate. The four captured by Mr. Smith became quite tame, and in matters of food showed a decided preference for young rats, though they would eat mutton, beetles, lizards and mice. Their call on waking up at nightfall was "precisely the same as two men cooeying to each other from a distance." (The cry known as coo-ey is the call-note of Australasian settlers.) The rock-crannies in which they live by day and build their nests are dry, narrow at the entrance, and often five or six yards deep. They become almost naked while molting, and in this state two of Mr. Smith's birds were stung to death by a swarm of bees.——It appears that small birds such as the silver-eyes (Zosterops) and the English sparrow are in New Zealand often killed by adhesion to the viscid carpels of *Pisonia brunoniana* or *P. sinclairii.*

Pisces.—In a letter received by Professor Liversedge from Mr. Caldwell, the latter states that the eggs of Ceratodus measure about $2\frac{1}{2}^{mm}$ in diameter, and have the protoplasmic pole darker, as in the Batrachia. The egg is surrounded by a strong closely-investing gelatinous membrane about $3\frac{1}{2}^{mm}$ thick. The segmentation is complete. "Part of the blastopore remains open, and persists as anus. The stages up to hatching closely resemble those of Amblystoma. After hatching, the larva goes into the mud. It lies on its side like Pleuronectidæ among the Teleosteans, and the oldest stages I have reared still show no traces of external gills. The larval changes, I expect, will continue for many

[1] Mr. S. A. Miller has probably already characterized this order from fossil specimens.

weeks." Mr. Caldwell states that he will leave a large number of the larvæ in an aquarium at the station in Queensland, and will also bring a supply of eggs to Sydney to rear in the laboratory.—*Nature.*

EMBRYOLOGY.[1]

ON THE TRANSLOCATION FORWARDS OF THE RUDIMENTS OF THE PELVIC FINS IN THE EMBRYOS OF PHYSOCLIST FISHES.—The two great subdivisions into which the species of Teleost fishes are divisible, viz., the Physostomi and Physoclisti, stand to each other in the relation of the unspecialized and the specialized in respect to the evolution of the paired fins. The members of the group Physostomi tend to retain the pelvic limb more or less nearly in its primordial position throughout life, and no marked tendency towards the approximation of the rudiments of the anterior and the posterior limbs seems to be exhibited by the embryo, as may be seen upon studying the development of a form as typical of the group as the salmon or trout. Such retention of the primordial posterior position of the pelvic fins by the embryos of Physostomes supplements those other more unspecialized traits which they possess, viz., the open pneumatic duct, persistent throughout life, and the simpler or more primitive condition in later life of the *paraglenal* elements (coraco-scapular plate in the embryo), commonly differentiated in the adult into hyper-, meso- and hypocoracoid, in Gill's nomenclature, whereas in the Physoclisti the mesocoracoid is suppressed. The frequently persistent protopterygian condition of a portion of median dorsal fin-system, developed as a so-called adipose fin, is another embryonic character retained by many Physostomes.

While the foregoing characters are unquestionably of value as determining the relative position of the two groups under discussion, I would now call attention to some embryological phenomena which demonstrate beyond any doubt that the Physoclisti have descended from the Physostomi.

In the young larva of Lophius, or the angler, taken from the egg shortly before hatching, A. Agassiz[2] has shown that the pectoral and pelvic fin-folds arise, the latter behind the former and almost synchronously, as lobate diverticula of the epiblast, into which mesoblast has been thrust outwards, and with their bases nearly horizontal. In this relation of position as anterior and posterior paired outgrowths they develop just as do the rudiments of the paired fins of the Physostomous salmon embryo; but the two pairs of fins are much more nearly synchronous in making their appearance, and are much closer together. The figure of the youngest stage of the angler given by Agassiz shows that there are but four myotomes opposite the interval be-

[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.

[2] On the Young Stages of Osseous Fishes, Part III, 20 plates; Proc. Amer. Acad. Arts and Sciences, Vol. XVII, July, 1882 (Plates XVI, Figs. 2–5, and XVII, XVIII).